Investing in the Common Good

Otto N. Larsen

Stephen Jay Gould, a distinguished Harvard paleontologist, writing in the January 1981 *Science*, observed that "Science is the most dialectical of human endeavors. Embedded in culture, it possesses unparalleled power to alter the very systems that nurture it." The excitement of scientific discovery is rooted in this claim. So, too, is an implication of value uncertainty. New knowledge always contains threat as well as promise. The alteration power of physics, chemistry, and biology is demonstrated regularly through engineering feats that are widely sensed and usually, but not always, valued. Not so for economics, sociology, or political science. The impact of the social sciences is more subtle, less readily acknowledged, and more often challenged in terms of worth.

There are many reasons for skepticism about social science as science—some profound, some erroneous and misguided. At the base of several arguments is the idea that while the nature of physical, chemical, and biological phenomena allow for regularities and thus for predictability, the nature of human nature is individualistic, volatile, changeable by virtue of observation, and, therefore, not really a matter to be understood in scientific terms—terms that require repetition, regularities, patterns.

This position implies that atoms are more real than attitudes, or that microbes and molecules are more stable and observable than, say, migration, monogamy, or monetary systems. Can one really be scientific about how people influence one another, how economies function, how organizations grow or decay, how rules and laws emerge and affect our lives, or why it is that there is not war of all against all? The answer would have to be "no" if such phenomena were, in fact, not patterned.

But patterns do exist. They emerge not to create a social science but to sustain and extend all that is human. In political, economic, cultural, and social matters, a wide range of behaviors is possible. The challenge is to discover which acts really occur, with what frequency, and under what conditions. In social science, as in the physical and biological research realms, it is exciting to discover the source of patterns, how they emerge, what forms they take, the linkages between them, how the patterns break, and how they change. Human social behavior does not yield meekly to probes that seek understanding through scientific research. But, over time and with increasingly sophisticated sets of observational and analytic tools, the substance of social science is maturing, even as its conceptions are changing.

How much money the federal government should expend for social science research depends, in part, on the value placed on the information, discoveries, and explanations that such research yields. Here the record becomes important. What achievements can be identified from past investments? A summary of the usefulness and public importance of the social sciences is presented by Kenneth Prewitt in this issue of *Society*. Clearly, the case for social science does not rely merely on findings that yield startling results. Social science involves the painstaking process of discovery and explanation that builds knowledge incrementally as findings are tested and understandings are revised. Knowledge of this sort is not divisible into private and public realms; it is a common good that requires public investments. Ultimately, costs must be measured against the gains in understanding and also against the risks of not proceeding with disciplined inquiry to discover just how social phenomena work and why social actions do not always work out as intended.

Geographical Inquiry

Each program in the Division of Social and Economic Science supports research that, in the judgment of technical experts, will add significantly to the fund of knowledge. Monetary, intellectual, and managerial resources are required. Government funding is augmented in the technical review process by strong voluntary support from the social science community. The concerted effort produces information, knowledge, and scientific explanations that are constantly updated by research thrusts

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that respond both to scientific curiosity and to changing national needs.

The primary objective of research in human geography is to advance understanding of the criteria, processes, and problems involved in the locational decisions of people, firms, and institutions that produce the spatial organization of society and economic activity. Traditionally, research has concentrated on the study of land use; the location of settlements, cultural groups, and economic activity; resource management; man-environment relationships; the migration of people; the movement of commodities; and the spatial diffusion of information. Recent geographic research has focused on location theory, regional economic development and stagnation (including urban regions), population redistribution, and the spatial analysis of social pathologies and public policy. Methodological emphasis is on improved variable specification and the development of computer simulation and micromodels of behavior in space.

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Many services, such as those provided by ambulances and fire-fighting equipment, are useful to the extent that they can respond quickly to calls. Clinics, hospital emergency rooms, schools and colleges, the farmer's grain elevator, and the urban shopping center also need to be optimally located for the efficient use of time and energy. Today, computer programs and mathematical methods of analysis are used to identify ideal locations. These approaches, developed by geographers and other social scientists with NSF support during the past ten years, include the use of mathematical theorems, special algorithms tested in a variety of conditions, computer graphics enabling visual presentation of demand data and of alternative planning schemes, and new modes of spatial analysis. As a result, decision makers in the public and private sectors can evaluate locations for different activities and decide which best meets defined criteria. Important scientific questions remain concerning spatial-choice processes and the spatial organization of society. Geographic models and conclusions must be tested against comparative data from other countries to improve the value of theoretical conclusions.

Organizational Research

Sociologists have long focused attention on large-scale organizations that occupy a crucial place in modern societies and on the processes of status and income attainment, which play an important role in the careers and well-being of individuals and families. In the 1960s, significant progress was made in analyzing organizational growth, change, and decay. Advances were also made in understanding how labor market outcomes for individuals were affected by training, education, race, and other personal characteristics. Limitations in theory, methods, and data made it difficult to link labor force and organizational variables and to formalize knowledge about this interaction.

One important research development supported by the National Science Foundation in the 1970s brought these two streams of research together. Studies of status attainment and social mobility began to consider how labor-market opportunities were affected by the social context and by employers' demands for labor. Analyses of organizations began to consider how management decisions affected the flow of personnel through the organizations.

One line of analysis disaggregated the national labor market and described regional labor markets, industrial and occupational sectors, and even specific firms and organizations. Such inquiries documented labor-market segmentation. The segments were internally organized by rules for entry and promotion. Such rules affect the opportunities for individual advancement. The size and rate of growth of employing organizations, and the composition of the labor force, helped to explain differentials in the distribution of income and other job rewards.

The theoretical and methodological basis for much of the recent research on the links between the internal operations of organizations and job opportunities was presented by Harrison White in his *Chains of Opportunity* (1970). He conceptualized the process of labor mobility as based on chains of vacancies. Whether vacancies that occur in an organizational hierarchy are filled internally or from the outside and the rate at which they occur have significant consequences for turnover, worker productivity, and worker motivation. This research represents a fundamental reconceptualization of labor markets and attainment processes. Its contributions to understanding institutionalized sources of opportunity, organizational change, and effective use of labor are substantial.

Robert Coles's research on Japan's labor force shows that with limited entry points, permanent employment, and few vacancies at any level, the costs of turnover to employer and employee are reduced. At the same time, motivation and efficiency remain high due to seniority rules and a system of deferred rewards. Productivity is high in part because there is little resistance to technological change. U.S. firms, in contrast, have a more flexible labor supply characterized by high voluntary quit rates. There is also considerable resistance to technological change in the labor force.

Shelby Stewman's study of internal labor markets gauges the consequences of change in organizational size, age of workers, seniority distributions, and salary schedules. Using mathematical models of vacancy chains and labor mobility in firms, he demonstrates that a decrease in system size does not result in lower costs, even when holding salary schedules constant. The major factor here is an increase in the average salary of staff caused by seniority-related increases. Similarly, a policy of lateral recruitment, rather than internal promotion, results in significant additions to labor costs. It also affects worker motivation and firm productivity. These studies make it possible to assess, with increased precision, the impact of organizational characteristics and management decisions on employment opportunities and on the costs and benefits of different labor policies.

One of the current thrusts of the National Science Foundation is continued support of research bringing sociological theory and methods to labor-force analysis. This will require additional research on sampling techniques and methods of analyzing job networks as well as application of increment-decrement models in demography to the labor force. Structural characteristics must be integrated with individual attributes to understand the complex relationships between labor supply and how the organization of demands affects employers and workers.

Governance and Law

During the last twenty years, marked change has occurred in the way that political scientists conduct their research. The result is an advance in the scientific understanding of basic political processes. Often referred to as the "behavioral revolution," this method views politics as an outcome of human interaction processes and decisions rather than merely as a product of legal statements and formal rules. Rigorous modes of explanation and analysis offer a contrast to conventional descriptive and literary approaches. NSF is the single largest supporter of systematic political research.

From its earliest days, the National Science Foundation has supported research into the historical and philosophical foundations of science itself. These studies illuminate the nature of science as a source of knowledge and explain the various modes in the development of scientific disciplines.

The period of the 1960s was particularly significant in this area of inquiry. One book, Thomas Kuhn's *Structure of Scientific Revolutions*, introduced critical ideas that still reverberate through the halls of the history and philosophy of science. In fact, the book captured large audiences both inside and outside the scientific community by asserting, among other things, that the contents of particular scientific theories are culturally relative pictures of the world, not absolute objective explanations.

Subsequently, historians and philosophers stepped up their analysis of the view that science is a strict, logico-deductive system that builds on prior work in a constant march toward "truth." Philosophers showed that this system simply would not work as a description of scientific explanation. Historians showed that the dominant system of logical analysis did not coincide with historical fact. Furthermore, they documented how many nonrational or even irrational factors affected the growth of science.

The decade of the 1960s ended in a state of intellectual crisis concerning an understanding of the nature and development of science. Research in the 1970s began a reconstruction of such basic ideas as the relation of theory and observation, the problem of inference, the nature of scientific explanation, and the interpretation of probability in statistical science.

Much progress has been made, but much is yet to be done. Research supported by the National Science Foundation has made clear that there is no single mode of development for all the sciences. Even within the same science, theory change does not always occur in the same way. The process of change is more likely to be evolutionary than revolutionary. When viewed from a distance, a sudden overthrow of one theory by another may seem to have occurred. On closer examination, the revolution is frequently seen to have occurred in small incremental steps.

Studies supported by NSF of the most recent "revolution" in science—that of plate tectonics in geology—support the evolutionary mode even when a Kuhnian revolution seems to have occurred. Plate tectonics successfully predicts new phenomena and appears to overthrow the accepted "steady state" theory. By careful analysis, however, historians and philosophers have found not so much a revolution but a shift in dominance. Plate tectonics is not a new conception. Earlier versions of it had been competing with the "steady state" theory for over half a century. Various theoretical explanations developed over this period. During most of this century, the steady state theory held the allegiance of most geologists. With the discoveries from ocean drilling expeditions, however, the allegiance of the majority of geologists shifted to the plate tectonics theory. Can a process of competition over a fifty-year period be called a revolution? Not likely, at least not in the Kuhnian sense.

Other projects supported by NSF have shown that what occurred in plate theory change was not the same as what occurred in another great revolution in our time—that of recombinant DNA. In this case we have no major theory shift but a change "merely" of technique. Yet this change in technique has revolutionized the conduct of biology as much or more than any recent theory change.

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Historians and philosophers of science are also directing scholarly inquiry to the great debate in systematics about the mode of operation of evolution—whether it occurs in increments or great leaps. Similarly, NSF has supported research to follow events in weak interaction in high-energy physics and in nutrino observations of the sun to see if and how "theory change" occurs in these disciplines. Historians are also carefully studying the great "revolutions" of the past—the Newtonian, Darwinian, and Einsteinian revolutions—to gain greater insight into those events.

There are multiple paths to theory change, and the forces operating to bring about these changes are much more complex than was assumed in the 1960s. It is on this central issue that studies in the history and philosophy of science are concentrating. It is a constructive phase—one that promises to create a knowledge edifice of many facets.☐

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Long-Range Value

Henry W. Riecken

The social and behavioral sciences are the most misunderstood of any we have. Many people seem to find it difficult to believe there is a *science* of behavior; I think this is because behavioral sciences deal with phenomena that, unlike astronomy or microbiology, are well within everyday experience. So everyone can, in some sense, consider himself an expert, an experienced observer of human behavior. Some people do not make any distinction between social science and social reform. Others think that social scientists only write social commentary—just another expression of opinion about social problems, perhaps couched in unusually dense jargon. These views are wrong. Most behavioral and social scientists spend most of their time doing exactly what other kinds of scientists do: making observations and measurements. A lot of effort has gone into improving the measurement of behavioral and social phenomena and a lot more effort is still needed, since the phenomena are complicated and complexly determined. Measurement of behavior is important for scientific behavioral research; and such social and behavioral measurements are used in various parts of our national life. The usefulness of systematic observations and valid measurements of human behavior is best illustrated through example.

Recently the Board of Directors of the Foundation for Child Development (formerly the Association for the Aid of Crippled Children) met to review and approve some project grants. One of the projects reviewed bears on the apparent increase in the incidence of child abuse. In New York City the number of cases of child abuse and neglect reported to the Office of Special Services for Children (Human Resources Administration of New York City) increased from 17,000 in 1978, to 20,000 in 1979, and to 30,000 in 1980. The number of case workers to investigate these reported incidents has been constant for a number of years, for the city budget has been under severe pressure. In order to handle the increased load, the Office divided the reported incidents into two groups—those which seemed to warrant full and detailed investigation, and those that appeared to be less serious and might be looked into quickly and closed out. Not all reported incidences of child abuse turn out to be valid. Sometimes the neighbor or relative who makes the report has misunderstood or misperceived an insignificant incident. In other cases the report may be made with great reluctance and only where the child's life is in danger. So it is important to be able to discern early and accurately whether a reported incident is high-risk or low-risk.

The best way to make such a decision would seem to be to rely upon the perceptive judgment of experienced case workers. Such is *not* the case. Two years of experience showed that a substantial number of high-risk cases (as shown by subsequent outcome) had been mistakenly assigned to the procedure for early closing while a number of low-risk cases were being investigated by more intensive methods, which also took longer and cost more.

Fortunately, the agency called in some behavioral scientists to help with the problem. They developed a screening technique, a risk-assessment scale that could be used by case workers to judge the probable severity or seriousness of the reported incident. The behavioral scientists devised this scale by using well-established psychometric principles and techniques. They analyzed information available in agency records to establish the relationship between characteristics of the case on intake

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